

REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-12 are presently pending in this application, Claims 1 and 6 having been amended by the present amendment.

In the outstanding Office Action, Claims 1-12 were rejected under 35 U.S.C. §102(b) as being anticipated by Jullian et al. (U.S. Patent 5,863,315).

Claims 1 and 6 have been amended to clarify the subject matter recited therein based on the disclosure in the specification,¹ and thus these claim amendments are not believed to raise a question of new matter. If, however, the Examiner disagrees, the Examiner is invited to telephone the undersigned who will be happy to work in a joint effort to derive mutually satisfactory claim language.

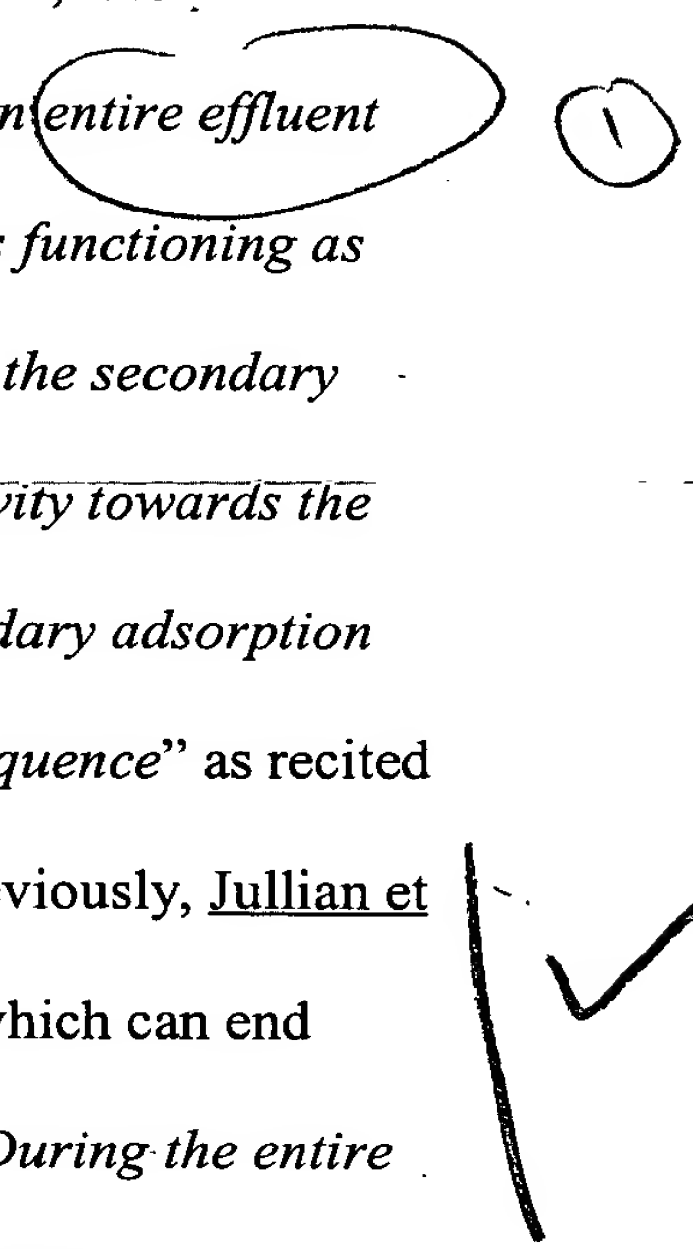
Before addressing the outstanding art rejection, a brief summary of Claim 1 is believed to be helpful. Claim 1 according to the present invention is directed to a process for separating mixtures of hydrocarbon isomers in gas phase on molecular sieves, and includes providing a plurality of columns each including molecular sieves and configured to function alternately such that the columns are designated to function from a secondary adsorption device, to a primary adsorption device, and to a desorption device in sequence, feeding the mixtures of hydrocarbon isomers to at least one of the columns functioning as the primary adsorption device such that isomers with a greater selectivity towards the molecular sieves in the mixtures of hydrocarbon isomers are adsorbed, feeding an entire effluent of the mixtures of hydrocarbon isomers from the at least one of the columns functioning as the primary adsorption device to at least one of the columns functioning as the secondary adsorption

¹ See, for example, Figures 1-3.

device such that remaining of the isomers with a greater selectivity towards the molecular sieves are adsorbed, discharging isomers with a lower selectivity towards the molecular sieves in the mixtures of hydrocarbon isomers from the at least one of the columns functioning as the secondary adsorption device and a desorbing agent remaining therein, feeding a desorbing agent to at least one of the columns functioning as the desorption device, discharging isomers with a greater selectivity towards the molecular sieves in the mixtures of hydrocarbon isomers and the desorbing agent in the at least one of the columns functioning as the desorption device, feeding the isomers with a lower selectivity towards the molecular sieves and the desorbing agent discharged from the at least one column functioning as the secondary adsorption device to a first distillation unit configured to recover the desorbing agent for recycling for the at least one column functioning as the desorption device, feeding the isomers with a greater selectivity towards the molecular sieves and the desorbing agent discharged from the at least one of the columns functioning as the desorption device to a second distillation unit configured to recover the desorbing agent for recycling for the at least one of the columns functioning as the desorption device, and rotating the columns from the secondary adsorption device, to the primary adsorption device, and to the desorption device in sequence. By feeding the mixture of hydrocarbon isomers and rotating the columns as such, only three phases are required to complete a cycle of the columns in the process while the adsorption is carried out in two adsorption devices connected in series, one being the primary adsorption device to be brought to saturation and the other being the secondary adsorption device serving as a control bed. As a result, the process according to Claim 1 provides a simple system while the adsorption yield of the extracted product is significantly increased. Also, because a complete cycle of adsorption and desorption can be carried out in three phases in the same duration, the process according to the present invention can be

carried out in an almost continuous sequence of the columns.

The outstanding Office Action maintains that Jullian et al. disclose a process as recited in Claim 1, because “Jullian et al. discloses an adsorption process wherein a hydrocarbon mixture feed is passed into a first adsorption zone ... into a second adsorption zone ... [and] into a desorption zone ...” (emphasis added in Italic). However, it is respectfully submitted that Jullian et al. are not believed to teach “feeding an entire effluent of the mixtures of hydrocarbon isomers from the at least one of the columns functioning as the primary adsorption device to at least one of the columns functioning as the secondary adsorption device such that remaining of the isomers with a greater selectivity towards the molecular sieves are adsorbed; ... and rotating the columns from the secondary adsorption device, to the primary adsorption device, and to the desorption device in sequence” as recited in Claim 1 as amended (emphasis added in Italic). Instead, as discussed previously, Jullian et al. disclose a process in which only one column carries out the adsorption which can end when or before the column is saturated and lasts three subsequent phases. During the entire adsorption phase, the outgoing stream of the column is first recovered as refined product, and only then partially fed to a following column for building up pressure in the following column (RP 2) before these two columns are connected without recovery between the two column.² Because of the presence of a non-negligible mass transfer zone and without a control bed in downstream, if the saturation of the column is reached, the purity of the refined product and the recovery are reduced, and if a mass transfer zone is limited in the column, a product having a high purity can be obtained but with a lower recovery. According to the Jullian et al. process, the nine phases include first pressurizing, depressurizing and second



² See, Jullian et al., column 3, lines 60-64, Figures 2 to 4, 5 to 7, 11 to 1, and 13 to 15.

pressurizing phases, while the process recited in Claim 1 does not use the pressure changes for adsorption and desorption. Furthermore, the desorbent is fed only to three phases out of the nine phases, the extract stream is present only in three phases, and only three out of the nine phases may have the same duration in the Jullian et al. process. On those bases, it is respectfully submitted that the subject matter recited in Claim 1 is believed to be distinguishable from Jullian et al., and thus is not believed to be anticipated nor rendered obvious thereby.

Claim 6 has been amended to include subject matter substantially similar to what is recited in Claim 1 to the extent discussed above. Thus, Claim 6 is also believed to be distinguishable from Jullian et al.

For the foregoing reasons, Claims 1 and 6 are believed to be allowable. Furthermore, since Claims 2-5 and 7-12 ultimately depend from either Claim 1 or 6, substantially the same arguments set forth above also apply to these dependent claims. Hence, Claims 2-5 and 7-12 are believed to be allowable as well.

In view of the amendments and discussions presented above, Applicants respectfully submit that the present application is in condition for allowance, and an early action favorable to that effect is earnestly solicited.

Respectfully submitted,

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IN THE CLAIMS

Please amend Claims 1 and 6 as follows:

--1. (Twice Amended) A process for separating mixtures of hydrocarbon isomers in gas phase on molecular sieves, comprising the steps of:

providing a plurality of columns each including molecular sieves and configured to function alternately such that the columns are designated to function from a secondary adsorption device, to a primary adsorption device, and to a desorption device in sequence;

feeding the mixtures of hydrocarbon isomers to at least one of the columns functioning as the primary adsorption device such that isomers with a greater selectivity towards the molecular sieves in the mixtures of hydrocarbon isomers are adsorbed;

feeding an entire effluent of the mixtures of hydrocarbon isomers from the at least one of the columns functioning as the primary adsorption device to at least one of the columns functioning as the secondary adsorption device such that remaining of the isomers with a greater selectivity towards the molecular sieves are adsorbed;

discharging isomers with a lower selectivity towards the molecular sieves in the mixtures of hydrocarbon isomers from the at least one of the columns functioning as the secondary adsorption device and a desorbing agent remaining therein;

feeding a desorbing agent to at least one of the columns functioning as the desorption device;

discharging isomers with a greater selectivity towards the molecular sieves in the mixtures of hydrocarbon isomers and the desorbing agent in the at least one of the columns

functioning as the desorption device;

feeding the isomers with a lower selectivity towards the molecular sieves and the desorbing agent discharged from the at least one column functioning as the secondary adsorption device to a first distillation unit configured to recover the desorbing agent for recycling for the at least one column functioning as the desorption device; [and]

feeding the isomers with a greater selectivity towards the molecular sieves and the desorbing agent discharged from the at least one of the columns functioning as the desorption device to a second distillation unit configured to recover the desorbing agent for recycling for the at least one of the columns functioning as the desorption device; and

rotating the columns from the secondary adsorption device, to the primary adsorption device, and to the desorption device in sequence.

6. (Amended) A process for separating mixtures of hydrocarbon isomers in gas phase on molecular sieves, comprising the steps of:

providing a plurality of columns each including molecular sieves and configured to function alternately such that the columns are designated to function from a secondary adsorption device, to a primary adsorption device, and to a desorption device in sequence;

feeding the mixtures of hydrocarbon isomers to at least one of the columns functioning as the primary adsorption device such that isomers with a greater selectivity towards the molecular sieves in the mixtures of hydrocarbon isomers are adsorbed;

feeding an entire effluent of the mixtures of hydrocarbon isomers from the at least one of the columns functioning as the primary adsorption device to at least one of the columns functioning as the secondary adsorption device such that remaining of the isomers with a greater selectivity towards the molecular sieves are adsorbed;

discharging isomers with a lower selectivity towards the molecular sieves in the

mixtures of hydrocarbon isomers from the at least one of the columns functioning as the secondary adsorption device and a desorbing agent remaining therein;

feeding a desorbing agent to at least one of the columns functioning as the desorption device; [and]

discharging isomers with a greater selectivity towards the molecular sieves in the mixtures of hydrocarbon isomers and the desorbing agent in the at least one of the columns functioning as the desorption device; and

rotating the columns from the secondary adsorption device, to the primary adsorption device, and to the desorption device in sequence.--